

What is claimed is:

- 1 1. A method for performing bit loading in a multicarrier communication
2 system, comprising:
3 obtaining transmission coefficients α_n for subchannels of a multicarrier
4 channel, where n is a subchannel index;
5 calculating initial cost values for said subchannels using said transmission
6 coefficients;
7 identifying a subchannel \underline{n} having a lowest cost value;
8 allocating a new bit to said identified subchannel \underline{n} ; and
9 updating said cost value of said identified subchannel \underline{n} , after allocating a
10 new bit, using a cost function:

$$\Delta P_n = f(C_n) - g(\alpha_n)$$

- 13
14 where C_n is a number of bits allocated to a subchannel n , $f(C_n)$ is a function of
15 C_n that returns a baseline cost value for allocating an additional bit to subchannel n ,
16 and $g(\alpha_n)$ is a function of transmission coefficient α_n .

- 1 2. The method of claim 1, further comprising:
2 repeating identifying, allocating, and updating for a total of R iterations,
3 where R is a number of bits to be allocated.

- 1 3. The method of claim 1, wherein:
2 said function $g(\alpha_n)$ is equal to $\log(\alpha_n^2)$, which is the logarithm of the
3 square of the channel coefficient of subchannel n .

- 1 4. The method of claim 1, wherein:
2 updating said cost value includes retrieving a value for $f(C_n)$ from a first
3 lookup table.

- 1 5. The method of claim 1, wherein:

2 updating said cost value includes retrieving a value for $g(\alpha_n)$ from a second
3 lookup table.

1 6. The method of claim 1, wherein:

2 calculating initial cost values includes evaluating the cost function:

3

$$4 \quad \Delta P_n = f(0) - \log(\alpha_n^2)$$

5

6 for each subchannel, where $f(0)$ is a baseline cost value assuming no allocated bits
7 for a subchannel n and $\log(\alpha_n^2)$ is the logarithm of the square of the channel
8 coefficient of subchannel n .

1 7. The method of claim 6, wherein:

2 calculating initial cost values includes retrieving a value for $f(0)$ from a
3 first lookup table.

1 8. The method of claim 6, wherein:

2 calculating initial cost values includes retrieving values for $\log(\alpha_n^2)$ from a
3 second lookup table for subchannels of said multicarrier channel.

1 9. The method of claim 1, wherein:

2 obtaining transmission coefficients includes acquiring said transmission
3 coefficients from a local channel estimator.

1 10. The method of claim 1, wherein:

2 obtaining transmission coefficients includes receiving said transmission
3 coefficients from a remote communication entity.

1 11. An apparatus comprising:

2 a channel determination unit to obtain transmission coefficients α_n for
3 subchannels of a multicarrier channel;

4 a bit allocation calculator to determine bit allocations for said subchannels of
5 said multicarrier channel using said transmission coefficients, said bit allocation
6 calculator to calculate cost values for said subchannels as a difference between a
7 first function and a second function;
8 a first lookup table to store and retrieve values of said first function for use
9 by said bit allocation calculator; and
10 a second lookup table to store and retrieve values of said second function for
11 use by said bit allocation calculator.

1 12. The apparatus of claim 11, wherein:

2 said first function is a function that returns a threshold cost of allocating an
3 additional bit to a subchannel based on a presently allocated number of bits.

1 13. The apparatus of claim 11, wherein:

2 said second function is a function that returns a logarithm of a square of a
3 transmission coefficient for a corresponding subchannel.

1 14. The apparatus of claim 11, wherein:

2 said channel determination unit is a channel estimator to estimate said
3 transmission coefficients using training signals received via said multicarrier
4 channel.

1 15. The apparatus of claim 11, wherein:

2 said bit allocation calculator is operative to: calculate initial cost values for
3 said subchannels of said multicarrier channel assuming zero bits allocated to each
4 subchannel, identify a subchannel with a lowest cost value, allocate an additional bit
5 to said identified subchannel, and update a cost value of said identified subchannel
6 using information from said first and second lookup tables.

1 16. The apparatus of claim 15, wherein:

2 said bit allocation calculator is operative to: identify a subchannel with a
3 lowest cost value, allocate an additional bit to said identified subchannel, and update

4 a cost value of said identified subchannel using information from said first and
5 second lookup tables for each bit to be included within a multicarrier symbol.

1 17. The apparatus of claim 11, wherein:
2 said multicarrier channel is an orthogonal frequency division multiplexing
3 (OFDM) channel.